Comparative assessment of offshore wind foundations presentation

Comparative assessment of offshore wind foundations

leanwind

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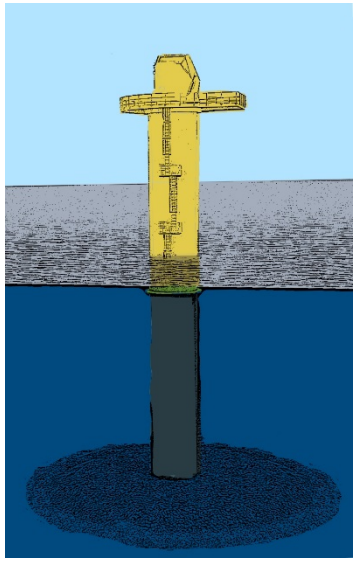
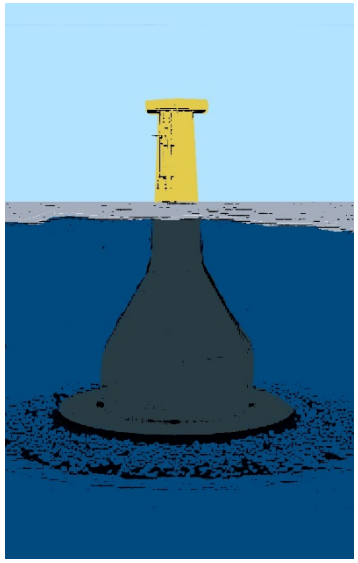
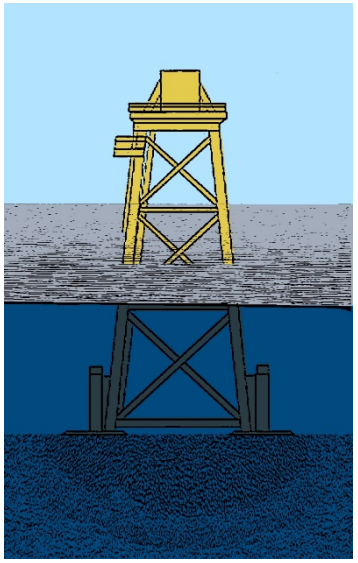
The research leading to these results has received funding from the European Union Seventh Framework Programme under the agreement SCP2-GA-2013-614020.

Introduction

- Life cycle impacts to be considered for several LEANWIND innovations, including:
  - foundation design
  - vessel design
  - novel O&M methods
- Initial analysis focusses on a foundation design







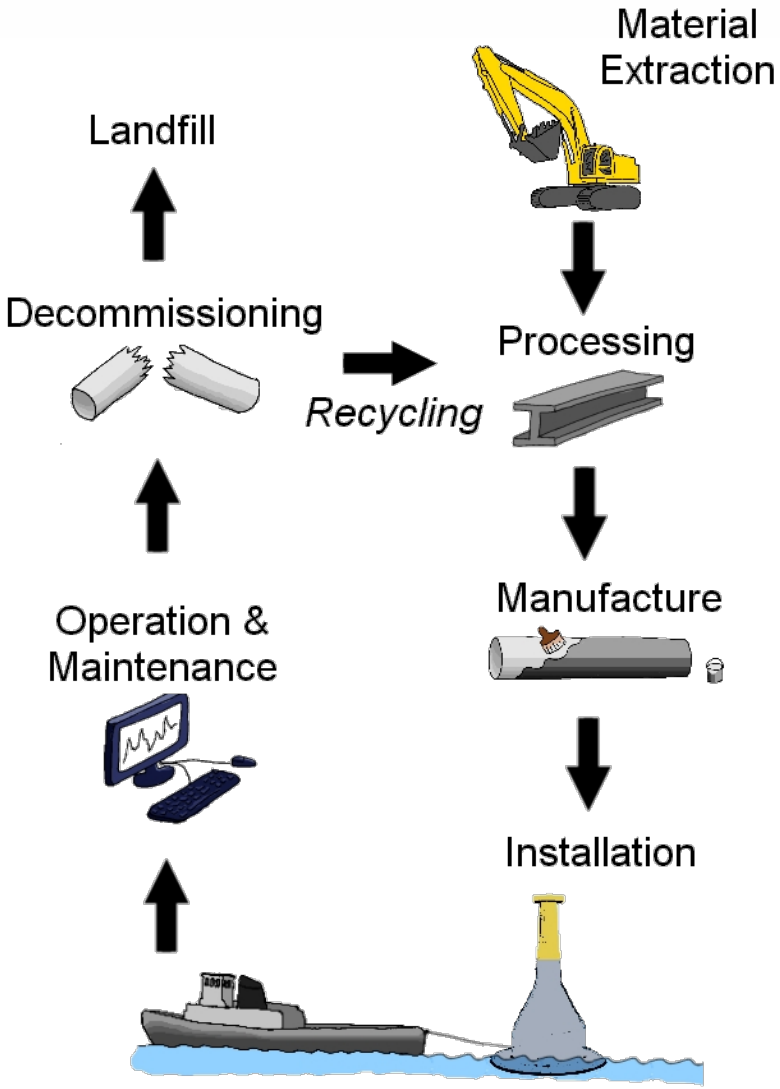
Scenarios

	Location	Water depth	Distance to port	Foundation type
Site 1	~ West Gabbard	35m	30km	Gravity Base
				XL Monopile
Site 2	~ Moray Firth	50m	100km	Gravity Base
				Jacket
Rest of life cycle consistent with foundation type				

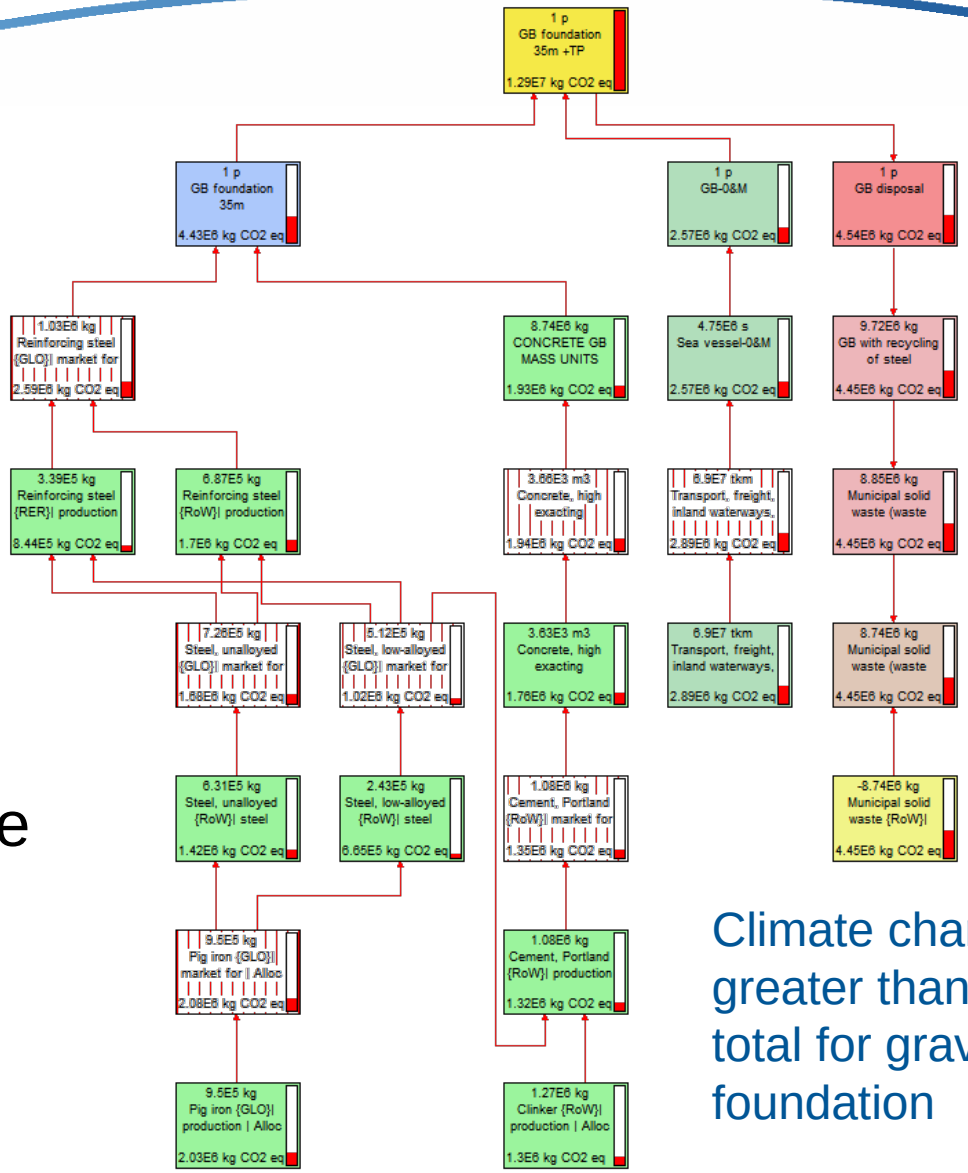
- 4 initial scenarios were selected
- Water depths are defined by available data for given foundations
- Analysis includes entire support system (foundation, transition piece and scour protection)
- Assume 8MW offshore turbine (Vestas V164-8) – impacts of turbine are NOT included

Full life cycle

- Materials & Manufacture
  - Mass-based analysis
  - Welding, rolling etc.
- Installation
  - Sea vessels
  - Preparation of sea bed
- Operations & Maintenance
  - Mostly by sea vessel
- Decommissioning & Disposal
  - Similar to installation
  - Recycling credit not considered



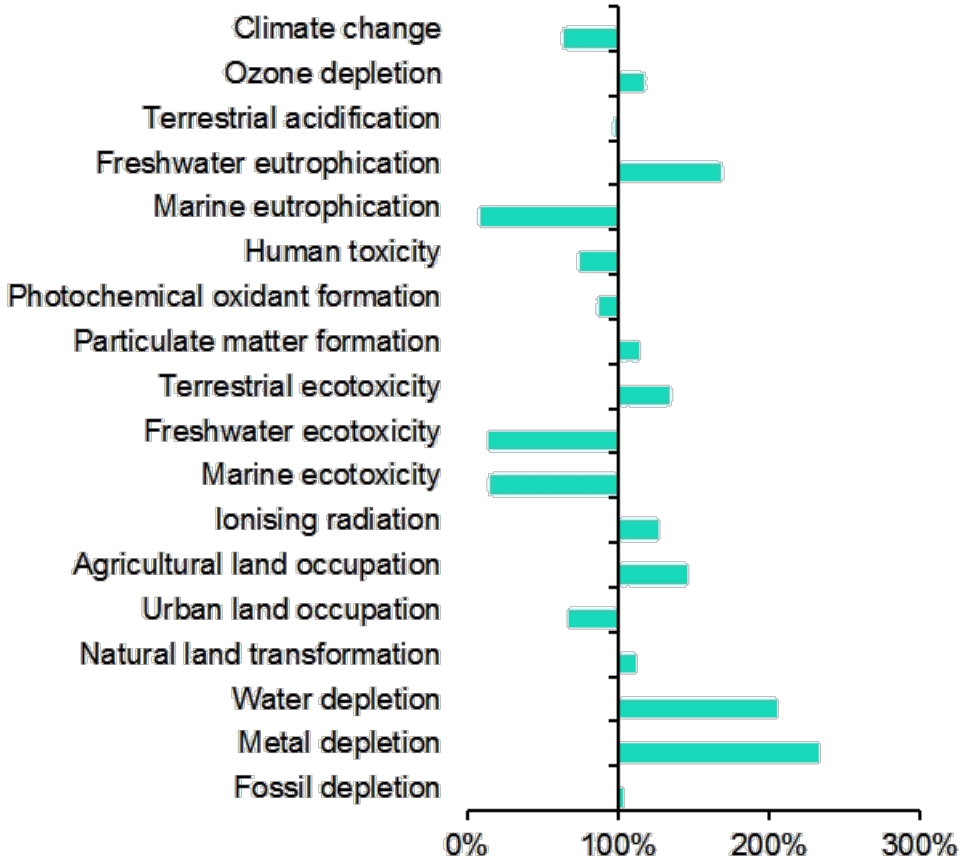
Analysis



- SimaPro v8
- Ecoinvent database
- ReCiPe Midpoint LCIA method

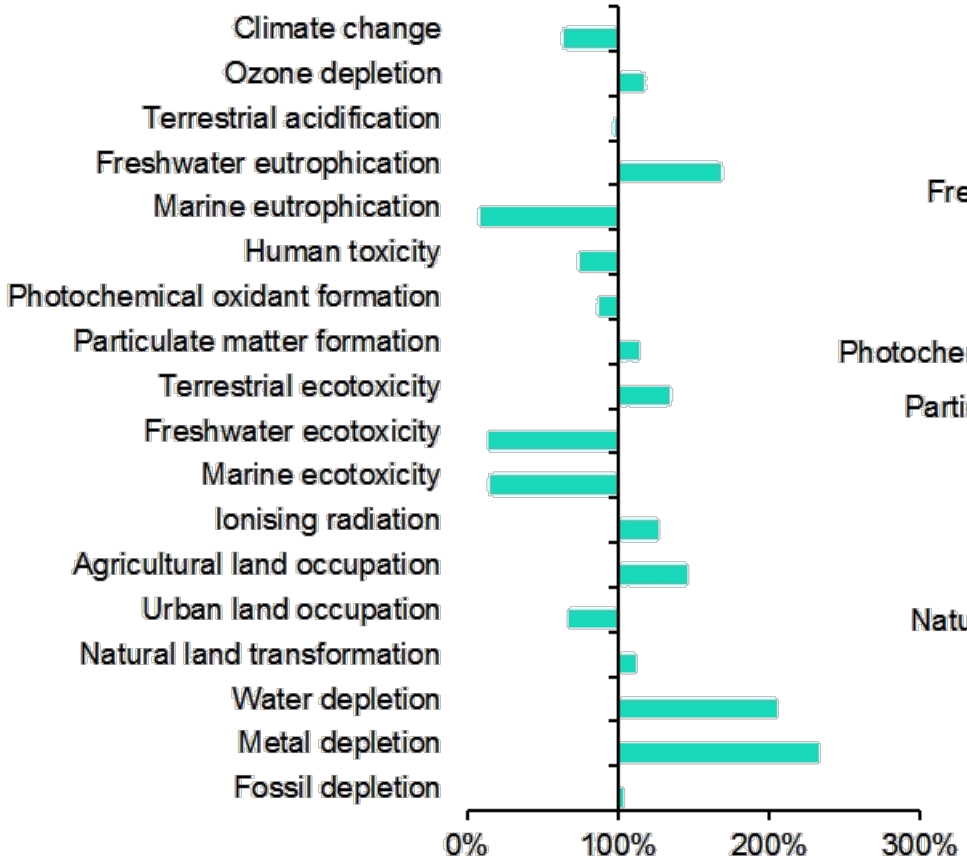
Climate change impact greater than 5% of the total for gravity base foundation

Site 1 Results



Performance of XL monopile in comparison to gravity base across all categories

Site 1 Results



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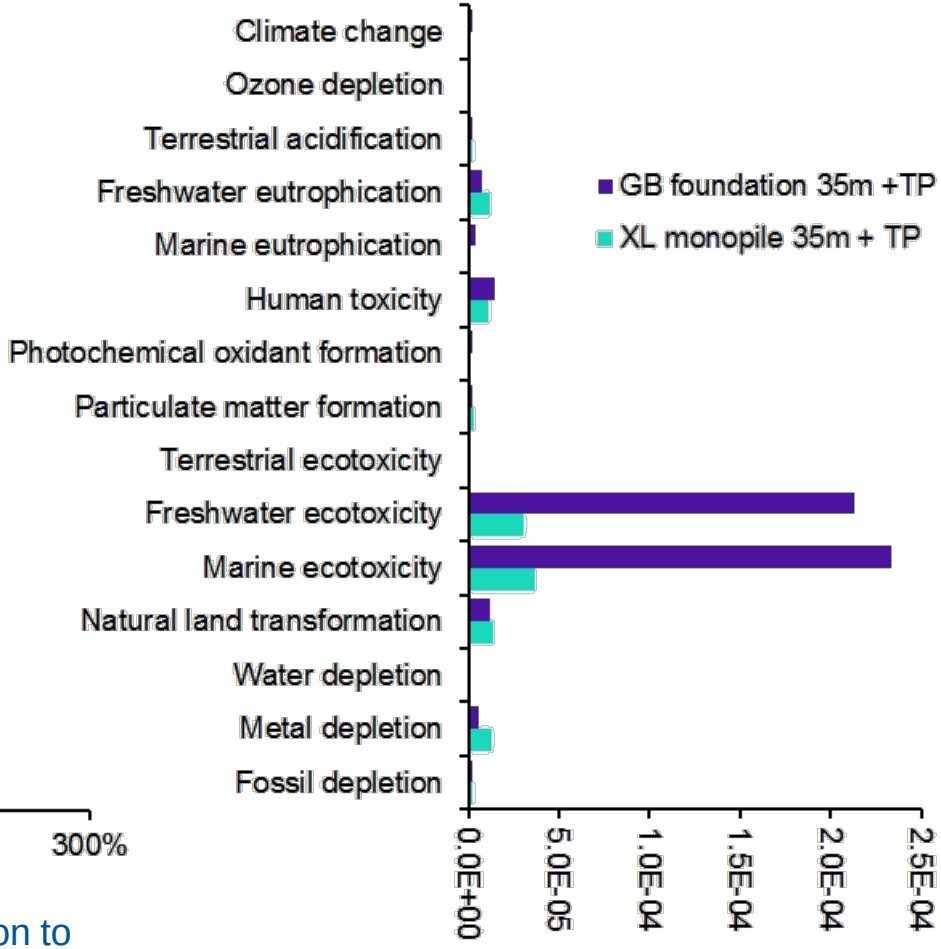
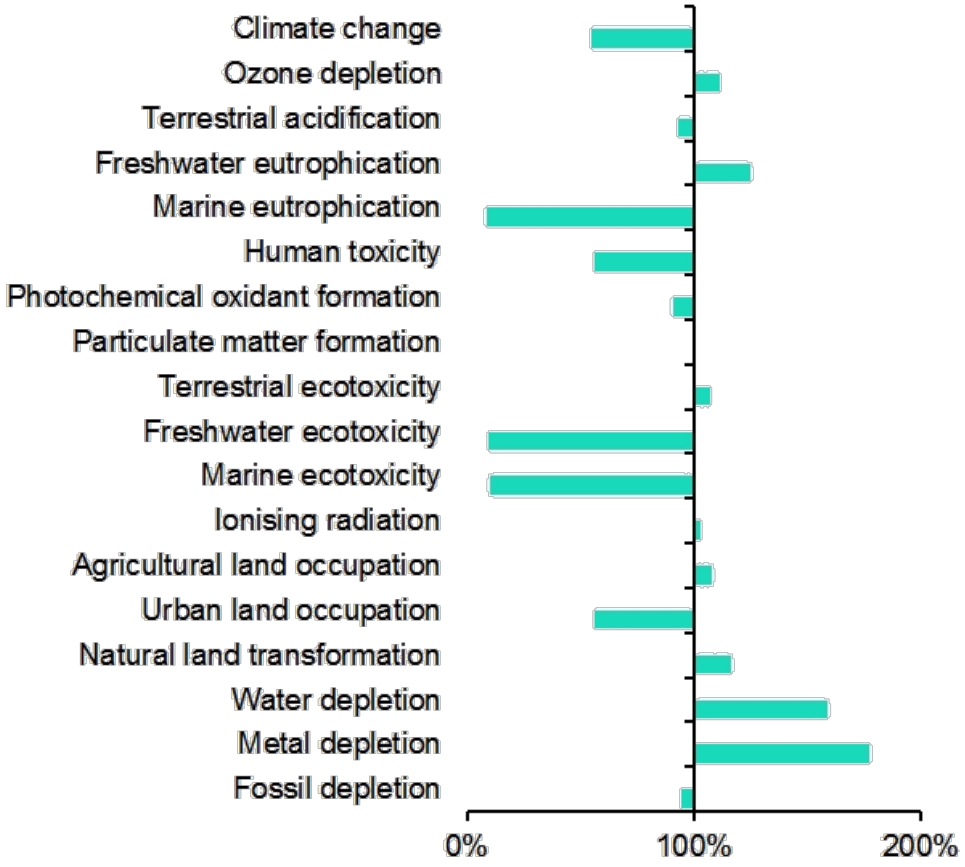


Normalised comparison

Site 2 Results



Performance of jacket in comparison to gravity base across all categories

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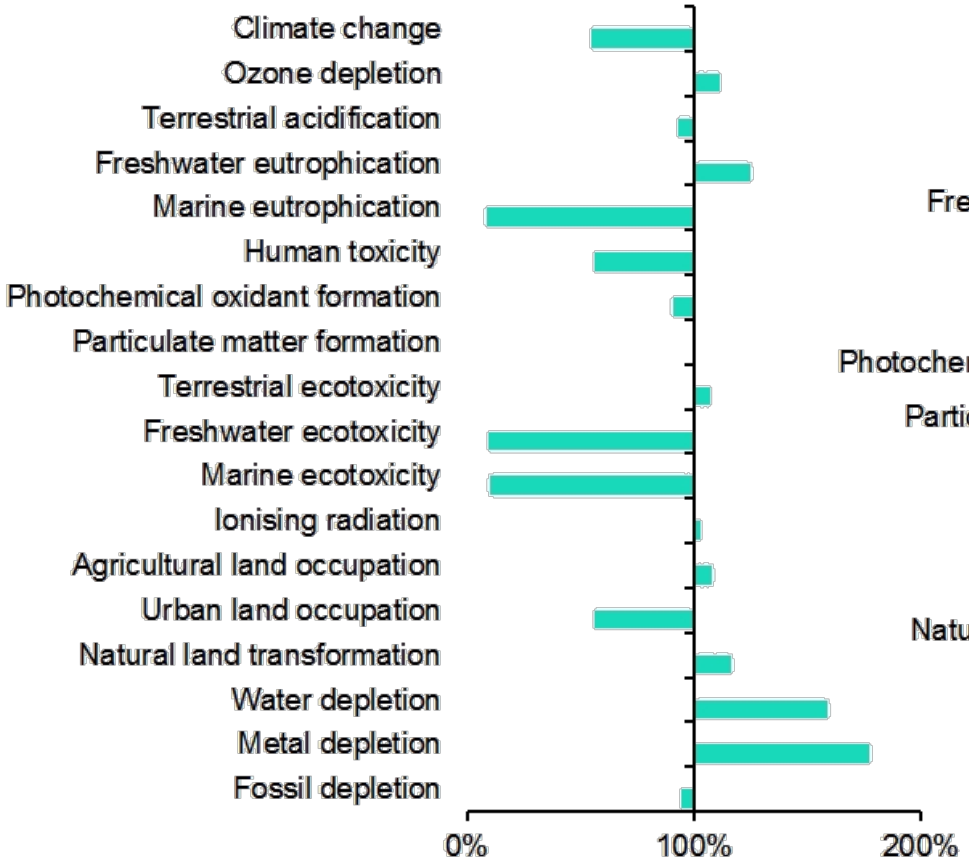

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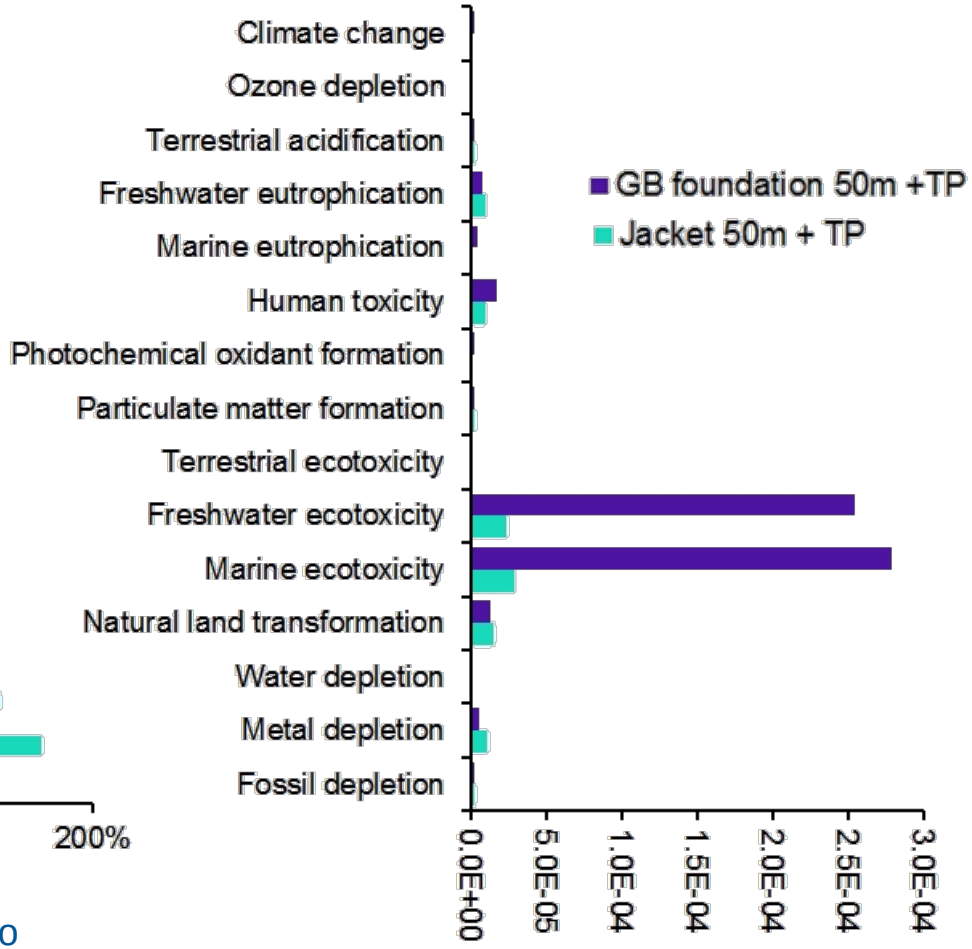
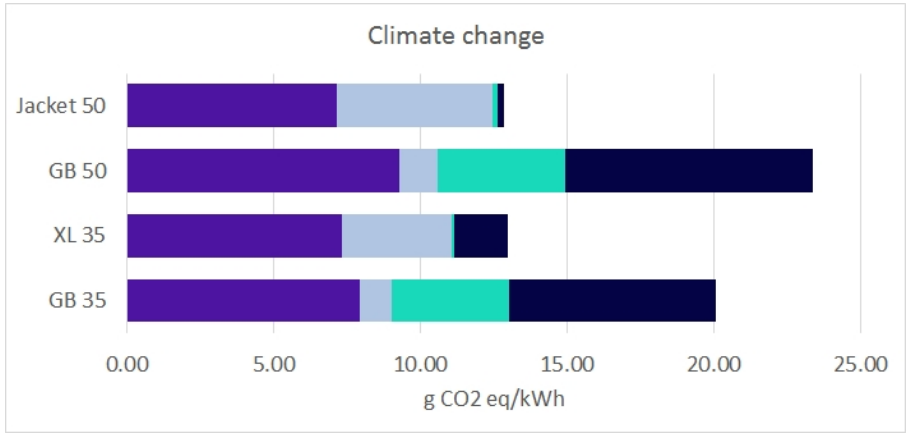
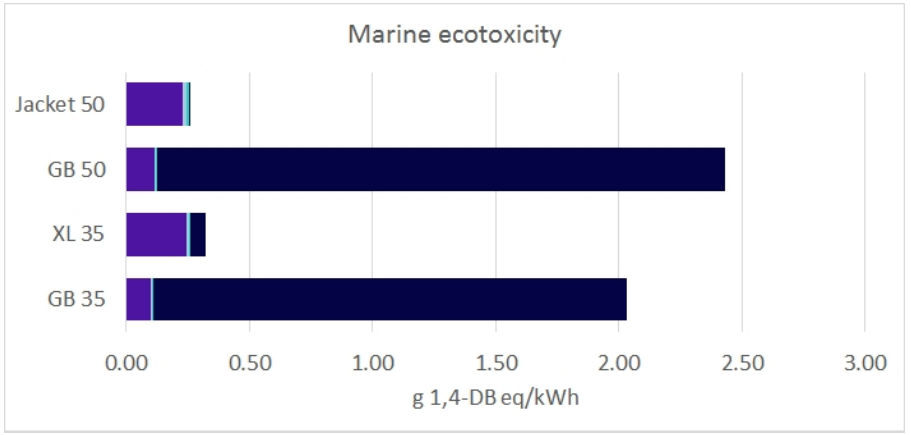
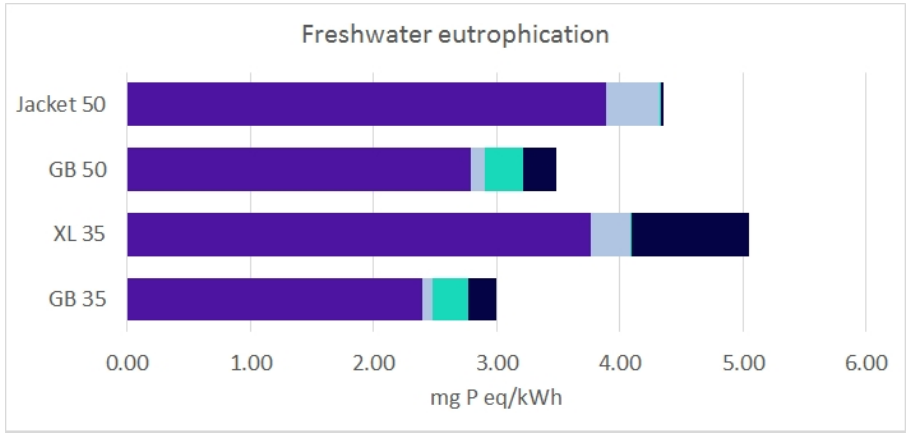


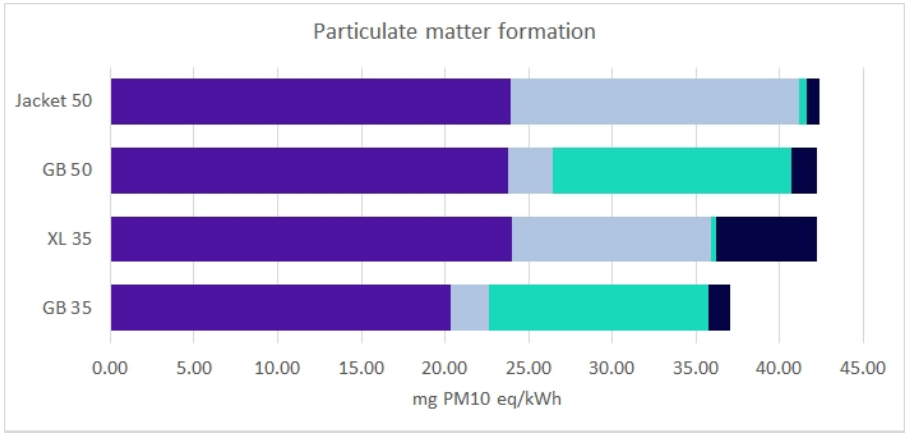
Normalised comparison

Selected Impact Categories









Materials and Manufacturing
Assembly & Installation
Operation & Maintenance
Decommissioning & Disposal

Conclusions

- Steel foundations (XL monopile and Jacket) perform better than gravity base foundations in most categories.
- Further investigation is required to identify the significant impacts of gravity base foundations at disposal stage.
- These results are not necessarily based on the foundation designs being considered in LEANWIND – more definitive conclusions will be possible when input data is refined.

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Thank you very much
for your attention